REMARKS

Claims 1-21 are in the case and presented for reconsideration. Claims 2 and 12 have been added. No new matter has been added.

The Abstract of The Disclosure has been objected to. A new Abstract has been provided and is enclosed herewith on a separate sheet.

Claims 2-9 and 12-21 have been rejected under 35 U.S.C. 112, second paragraph, for being indefinite. The Applicant would like to point out that original Claims 2 and 12 do not include the term "concluding". The Applicant has construed the basis for this rejection to be related to the term "completing" claimed in Claim 2 and Claim 12. Although the Applicant disagrees with the basis of the perceived rejection, both Claim 2 and Claim 12 have been amended in an effort to proceed with prosecution.

Claims 1-7 and 10-19 have been rejected under 35 U.S.C. 103 (a) as being unpatentable over U.S. Patent 6,161,032 (Acker). With respect to this rejection, the Examiner has stated:

> Acker '032 teaches all the features of the instant invention including the use of a medical probe being introduced within a magnetic field, aligning the sensor incorporated in the probe within the mapping volume and performing a calibration method correcting for any errors on the basis of a calibration procedure, wherein the calibration is repeated through-out the mapping volume (see Figure 1 and Figure 4; also see col. 5, lines 56-67 and col. 6, lines 1-28; referring to a sensor 30 included in a medical probe which detects magnetic fields and col. 10, lines 7-67 and col. 11, lines 1-19; describing the calibration procedure within the magnetic field).

> Acker '032 does not specifically teach the mathematical formula for calibration as claimed in the instant invention. However, it would have been obvious to one skilled in the art at the time that the invention was made to have used a functional equivalent of such a calibration as used in Acker '032 which would determine the calibration on the basis of the difference between the expected and actual measurement and make a determination as to an acceptable error limit, as these constitute calibration procedures well within the knowledge of skilled artisans.

In comparing Figures 1 and 4 of Acker '032 with Figures 1 and 2 of the instant invention, it is evident that the dimensions of the mapping areas are comparable.

The Applicant would like to focus on the specific teachings found in Acker. Particularly, Acker describes a three-axis coil sensor and system which utilizes reference field transducers 100 and calibration field transducers 316 that cooperate with the reference field transducers (coils) 100. Column 8, line 64 – Column 9, line 4. A second embodiment for the system has a fixed array of calibration field transducers 55 which include a plurality of calibration field transducers 56 and a plurality of reference field transducers 100. Column 10, lines 31-54.

It is important to note that the calibration algorithm utilized in both embodiments is contained in International Patent Publication WO94/04938 and described in Acker beginning on Column 9, line 11 and throughout the Disclosure. As described in the Acker reference, this algorithm includes utilizing an initial estimate of the position of the reference field transducer coil, for instance coil 100a, wherein orientation angles for coil 100a are calculated using the initial estimate of position and the detected field component magnitudes at the calibration transducer, for example, 316b. Column 9, lines 4-66 and Column 10, lines 31-54.

With respect to the calibration method described in Acker, it is important to note that there is absolutely no specific teaching, suggestion or inference related to a method for calibrating a method system that includes accounting for a metallic object placed within the mapping volume of the system. Moreover, the method and algorithm described in Acker is directed toward calibrating the reference field transducers (coils 100) of each reference assembly 50 of the system. This is entirely different than the calibration method in accordance with the present invention that not only accounts for metallic objects within the mapping volume of the system, but also is directed to the calibration of a sensor placed within the mapping volume and subjected to a series of novel steps to include an interpolating step and an error limit comparison step (Claim 1) and an extrapolating step and error limit comparing step (Claim 11). The combination of novel method steps, to include those outlined above, for the Applicant's calibration method of Claim 1 and Claim 11 are simply not addressed nor even inferred in Acker.

Likewise, Claims 2-10 of the Applicant's claimed present invention depend either directly or indirectly from Claim 1 and further patentably distinguish the claimed invention over Acker. Claims 12-21 of the Applicant's claimed invention depend either directly or indirectly from Claim 11 and are further patentably distinguished over Acker as well.

Claims 8-9 and 20-21 have been rejected under 35 U.S.C. 103(a) as being unpatenable over Acker as applied to Claims 7 and 19 above, and further in view of U.S. Patent 5,086,401 (Glassman et al.). With respect to this rejection, the Examiner has stated:

> Acker '032 does not teach the use of the robot for manipulating the calibration of the procedure by moving the medical probe incorporating the sensor.
>
> In the same field of endeavor, Glassman et al. '401 teaches the use of a robot to manipulate the medical probe of interest in order to automate medical procedures (see col. 2, lines 18-46).
>
> It would have been obvious to one skilled in the art at the time that the invention was made to have modified Acker '032 and incorporated the teaching of Glassman et al. '401 to carry out the calibration procedure of the medical probe of interest as that would automate the calibration procedure.
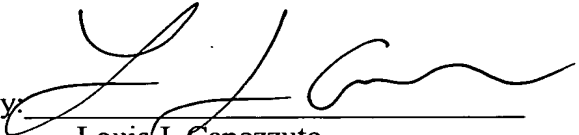
Glassman et al. describes an image-directed robotic system for precise robotic surgery including redundant consistency checking. The Applicant would like to point out that this reference is directed toward a particular robotic surgical system only and does not in any manner address a robot controlled calibration system for calibrating a sensor. Thus, not only does this reference constitute non-analogous art, but, even if one of ordinary skill were to attempt to utilize this reference and combine with the Acker reference, there is no way that this skilled artisan would ever arrive at the Applicant's novel claimed invention. Accordingly, Claims 8-9 and 20-21 of the Applicant's claimed invention are neither anticipated by nor rendered obvious by these references.

Therefore, by this Amendment and for the reasons listed above, the Applicant's claimed present invention is both patentably distinct and non-obvious over the prior art of record and favorable action is respectfully requested.

Serial No. 09/621,322

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page(s) is/are captioned "Version with markings to show changes made".

Respectfully submitted,

By: _____
Louis J. Capezzuto
Reg. No. 37,107

Johnson & Johnson
One Johnson & Johnson Plaza
New Brunswick, NJ 08933-7003
(732) 524-2218
Dated: February 19, 2003

- 7 -

VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Specification:

Please delete the abstract and substitute therefore a new abstract which is provided on a separate sheet and enclosed herewith.

[A method for calibrating a medical system capable of generating a magnetic field for tracking a position of a medical device comprises various steps such as defining a mapping volume within the generated magnetic field and placing a metallic object within the mapping volume. A sensor is aligned at a first point within the mapping volume and the magnetic field at the first point is measured with the sensor to establish a first coordinate position (X_i, Y_i, Z_i). The sensor is moved to a next point $(X_i + dx, Y_i + dy, Z_i + dz)$ along one coordinate axis by an added distance component (dx, dy, dz) and the magnetic field at the next point is measured to establish a next coordinate position. The magnetic field at an intermediate point between the first position and the next coordinate position is interpolated to establish an interpolated intermediate coordinate position. The position difference between the interpolated intermediate coordinate position and an actual intermediate coordinate position is determined and the position difference is compared to an error limit. (X_i, Y_i, Z_i) of the next point is set as $(X_i = X_i + dx, Y_i = Y_i + dy, Z_i = Z_i + dz)$ if the position difference is within the error limit and the steps above are repeated along another coordinate axis. The added distance component (dx, dy, dz) is set by decreasing the value of the added distance component if the position difference is not within the error limit and the steps above are repeated along the same coordinate axis. A second embodiment utilizes an extrapolation of the magnetic field at the next point from the first position and calculation of the extrapolated next position. The difference between the calculated next position and the actual next position is then compared to an error limit. If the error limit is exceeded, the magnetic field of an intermediate point is measured and an intermediate position is determined along the same coordinate axis and the magneticfield of the next point is extrapolated from the intermediate position and the procedure is iterated until the error limit is met whereby the sensor is moved to a new point along another coordinate axis.]

In the Claims:

Please amend Claims 2 and 12 as follows:

Claim 2   (Amended) The method according to Claim 1, including [completing] <u>using</u> the calibration method for the entire mapping volume.

Claim 12. (Amended) The method according to Claim 11, including [completing] <u>using</u> the calibration method for the entire mapping volume.